

**RUDOLFINA CAVERNICOLA, A NEW SPECIES OF CAVE-ASSOCIATED
SPHAEROCERIDAE (DIPTERA) FROM COLORADO AND ARIZONA**

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Abstract.—*Rudolfina cavernicola*, new species, is described from several collections from Kremmer's Cave, Colorado, and a single specimen from Arizona. Characters are given to separate the two western North American *Rudolfina*. Six species of Sphaeroceridae are listed from Kremmer's Cave, and the cave habitat is described.

Key Words: Sphaeroceridae, *Rudolfina*, caves

The genus *Rudolfina* Roháček can be recognized on the basis of the stout, upturned female cerci that are fused with the epiproct and middle part of tergite 8; the long costagial bristle; and the characteristic dark lobes of male sternite 5. There is one described Nearctic species, *Rudolfina digitata* Marshall, and one described Palearctic species, *R. rozkosnyi* (Rohacek), both of which exhibit disjunct arctic-alpine distributions (Marshall 1991). *Rudolfina* includes several undescribed southeastern Nearctic and Neotropical species, but *Rudolfina cavernicola*, new species, is closely related to the western North American *R. digitata* and the European *R. rozkosnyi*.

The cave-inhabiting Sphaeroceridae of eastern North America were discussed by Marshall and Peck (1984), who recorded 10 species of which at least one (*Spelobia tenebrarum* (Aldrich)), is a true troglobite, and at least one, (*Terrilimosina racovitzae* (Bezzi)), is a troglophile. Little is known about cave Sphaeroceridae in western North America, although one troglophilic species, *Limomyza cavernicola* Marshall, was recently described from in or near caves in Missouri, Kentucky, Oklahoma, and Colorado (Marshall 1997). Most of the type se-

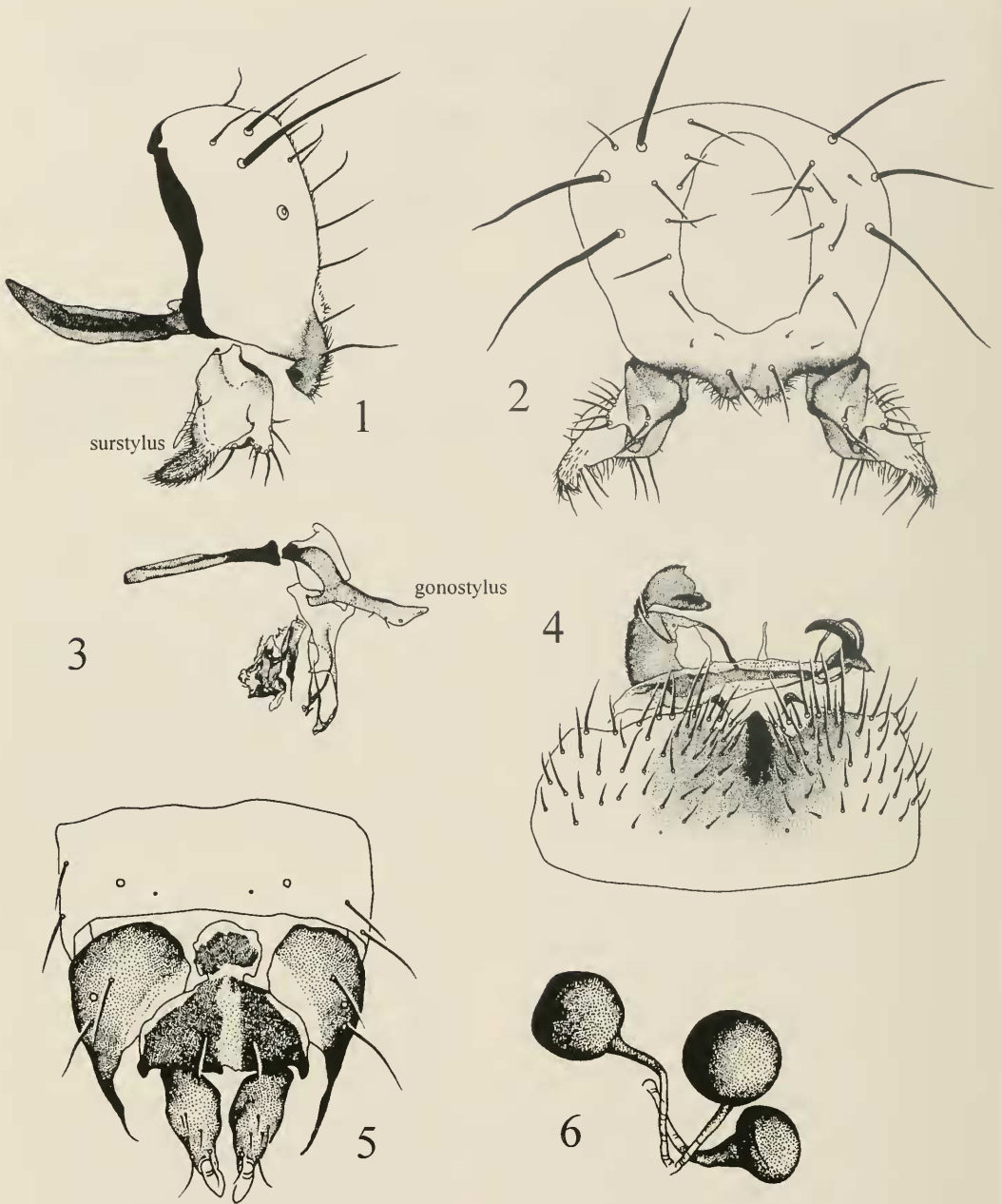
ries of the new species described here, *Rudolfina cavernicola*, is from Kremmer's Cave, Colorado. *Spelobia pseudosetaria* (Duda), *Spelobia tuberculosa* Marshall, *Spelobia maculipennis* (Spuler), *Xenolimosina sicula* Marshall and *Limomyza cavernicola* Marshall were collected in Kremmer's Cave with *Rudolfina cavernicola*.

KEY TO WESTERN NORTH AMERICAN
RUDOLFINA

- Eye height ca. 1.8× genal height. Second costal sector longer than third. Male sternite 5 with 3 posteromedial lobes, outer 2 small, equal to one another (Fig. 4). Distal lobe of surstylus setose, rounded (Fig. 1). Gonostylus expanded preapically (Fig. 3).
. *Rudolfina cavernicola*, new species
- Eye height ca. 1.4× genal height. Second costal sector shorter than third. Male sternite 5 with two posteromedial lobes, one bifid and one single. Distal lobe of surstylus elongate, bare, with multiple translucent lobes. Gonostylus narrow, tapered apically.
. *Rudolfina digitata* Marshall

***Rudolfina cavernicola* Marshall and
Fitzgerald, NEW SPECIES**
(Figs. 1–6)

Description.— Body uniformly pale brown; length ca. 2.0mm. Interfrontal plate



Figs. 1-6. *Rudolfina cavernicola*. 1-4, Male abdominal structures. 1, Terminalia, left lateral. 2, Terminalia, posterior. 3, Aedeagus and associated structures. 4, Sternites 5-7. 5-6, Female abdominal structures. 5, Tergites 7-9 and cerci. 6, Spermathecae.

equal in depth and width, bordered by 3 interfrontal bristles, the lower pair cruciate over lunule. Eye height 1.8 times genal height. Mid tibia of male slightly curved,

anteroventrally with a row of short, stout bristles on distal two thirds; mid tibia of female with a single small anteroventral bristle near middle. Dorsocentral bristles in

a single large prescutellar pair; 2 pairs of prescutellar acrostichal bristles, middle pair very long. Wing with costagial bristle long, longer than dorsocentral bristle; second costal sector slightly longer than third, costa ending 2–3 vein widths beyond apex of R_{4+5} .

Male abdomen: Sternite 5 with 3 posteromedial lobes (Fig. 4). Surstylus with a broad, subquadrate basal part and a narrow, setose distal part (Fig. 1). Epandrium with 3 long posterodorsal bristles on each side (Fig. 2). Subanal plate large, broadly fused; cerci small, setose. Gonostylus apically expanded, boot-shaped (Fig. 3). Distiphallus broad, complex, functional ventral surface with diverging arms, distal part of functional dorsal surface with crenulate plate on each side.

Female abdomen: Tergite 9 (Fig. 5) prolonged into a short, blunt lobe between the 2 halves of tergite 8, lobe dark and separated from rest of tergite 9 by pale area, main part of tergite 9 with a longitudinal pale strip. Sternite 7 large, dark, posterior margin spinulose; sternite 8 reduced, with 4 small, stout bristles. Sternite 9 posteromedially thin and pale. Cercus distinctly upturned, with a stout spur at apex (Fig. 5). Spermathecae round, tire-shaped; stem long.

Holotype.—♂, COLORADO. Larimer Co., 3 April, 1992, S. Fitzgerald, Kremmer's Cave, 6000', Rt 287,6 mi N of Jct. Rt. 14. (Canadian National Collection)

Paratypes.—Colorado. Kremmer's Cave, 5.8.22.viii.1996 (1♂, 2♀, 30.ix–27.x.1996; 9♂, 3♀ in pit trap @ 85' from entrance; 1♀ in pit trap @ 30' from entrance; none taken in pit traps @ 9' from entrance during same period), Scott Fitzgerald (University of Guelph and Colorado State University collections). Arizona. Hospital Flat, Pinaleno Mts., 8950', 3.viii.1965, H. Leech (1♂, California Academy of Sciences).

Comments.—Although the male genitalia of *R. cavernicola* are strikingly different from those of *R. digitata*, the female terminalia of these closely related species are

very similar in structure. Both species have a divided tergite 8, with the anterior part of tergite 9 separate from the main part of tergite 9 and between the halves of tergite 8. However, tergite 8 of *R. cavernicola* is not strongly wrinkled like that of *R. digitata*, and the spermathecae are longer. The biology of *R. digitata* is unknown, but since it has smaller eyes than those of *R. cavernicola* it is assumed that both of these species are subterranean in habit.

Kremmer's Cave is a small solution cave formed in Ingleside limestone along the east slope of the hogback in northern Colorado (Parris 1973). The cave is basically one 100 ft. long room sloping downward at about 35°. The room is largest medially, about 20 ft. wide with a 7 ft. ceiling, and narrowest near the entrance and low, terminal crawlway. The pit entrance is about 2 ft. in diameter and 3 ft. deep, and although the cave is short, it becomes cave-like (dark, humid, and of a relatively constant temperature) quickly, due to the small opening to the outside. In August the ambient air temperature taken at 25 ft. in from the bottom of the pit entrance was 42° F.

Specimens of *R. cavernicola* were collected within the first 25 ft. from the bottom of the pit entrance, henceforth referred to as the entrance-way, using an aspirator, and at 30 and 85 ft. from the bottom of the pit entrance with pitfall traps baited with slices of ripe banana. Since *R. cavernicola* was collected in sympatry with several other species of sphaerocerids, field identification was not possible and thus, the following general observations include all above mentioned species. In the entrance-way flies were observed resting or running on pieces of moist wood, among broken rock, rock pillars (probably reminiscent of the cave's discovery during a limestone mining operation (Parris 1973)), and on cave walls. Flies jumped or ran when disturbed, but were never observed to fly.

Rodent droppings, most covered with various microfungi, seem to be the most abundant food source in Kremmer's cave.

However, the nature of the pit entrance allows rain water to wash in organic debris, a minimal amount of bat guano exists near the back of the cave, and a rodent jaw bone suggests at least an occasional carcass, all of which may be possible larval food sources. As most cave-associated sphaerocerids utilize a wide range of breeding substrates (Papp and Plachter 1976), and *R. cavernicola* was apparently attracted to banana, it is probable that *R. cavernicola* is not restricted to a single food source.

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